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2. General

This Thermatur 200 repair guide will help you to recognize and solve most of the problems with Thermatur 200.
However, in addition to this manual, a detailed service training is a must. Please contact our service department for more information:

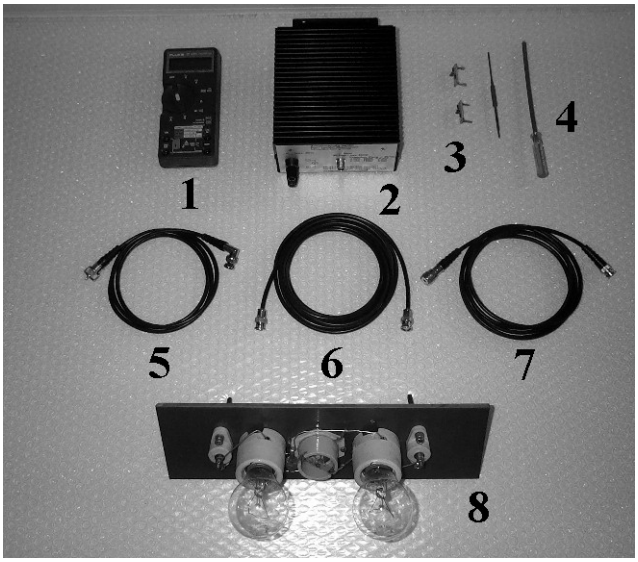
GymnaUniphy service department
Pasweg 6a
3740 Bilzen, Belgium
General Fax number service dept: 0032/89.510.561

Technical questions:
Tel: 0032/89.510.563
Service@gymna-uniphy.com

Spare parts:
Tel: 0032/89.510.523
Spareparts@gymna-uniphy.com

3. Tools

1. Digital calibrated multimeter (10 A DC min.)
2. Dummy load 50 Ohms (ordering ref: 08763)
3. LED mismatch detector
4. HF screwdriverset
5. Patient cable for plode 8 or 14 cm (new model)
6. Lambda/2 cable (Lenth 3630 mm): ref 15335
7. Patient cable for plode 8 or 14 cm (old model)
8. Lamp dummy load



4. Hardware evolution of Thermatur 200

Version A:
Initial version.
Starting in all units from SN 10 (01/1992)

Version B:
Modification of tuning capacitor.
Capacitor is divided in 2 parts:
- Fine adjustment capacitor plate
- Coarse adjustment capacitor plate

This will result in a more 'stable' tuning during the treatment since the unit can change the capacitor value in smaller steps.
This modification was introduced together with the release of software version 6.2.
For 230 V units: starting from SN B852 (05/1996)
For 115V units: starting from SN B5047 (05/1996)

Power supply FUBA 702

New, smaller PCB (for more information: chapter 4.1.2)

For 230V: starting from units with SN B1253 (01/1999)
For 115V: starting from units with SN B5101 (04/1999)

Power supply FUBA 702A

Same as FUBA 702, but with adjusting potmeter.

For 230V: starting from units with SN B6058 (12/1999)
For 115V: no information

Version C:
Amplification of SUM/DIFF of A 200 from 1 to 0.82. The generator A 200 remains forwards and downwards compatible.

For 230V: starting from units with SN C6168 (06/2000)
For 115V: no information

5. Software evolution of Thermatur 200.

V 6.0:
Initial version: from 12/1991 to 09/1992

V 6.1:
Improved keyboard function. From 10/1992 to 04/1996

V6.2:
Together with hardware modification to version B.
Indication of intensity: displays set power and not the real power.
For 230 V units: starting from SN B852 (05/1996)
For 115V units: starting from SN B5047 (05/1996)

V 6.3:
Special version. Indication of peak power (max: 400 watts)
For 230 V units: only for SN 6209 to 6217.

V 6.42:
For units delivered in 2002.

In version 6.2, the error message FE6 showed up in case of strong patient movements during a treatment. This problem is solved in version V6.42.

In case of a poor tuning (SWR>6), the unit will start searching for a better position of the tuning capacitor, just like it does when starting a treatment (full turn).
In case of SW V6.2, the unit could hang up (oscillation). This problem is solved in version V6.42.

The range in which the generator starts oscillating is reduced.

6. Operating voltages

Before any repair work shall be done, it is important to check the operating voltages.

6.1 Mains power

When the unit is powered up, both the mains switch and the display will light up. If not check the mains fuses (F001/F002) and replace with the same type:
230 V: SP 6.3A fast (ceramic pipe)
115 V: FST 6.26A, slow (glass pipe)

6.2 Operating voltages coming from power supply PCB (A 100)

What you need to know:

There are 3 different versions of power supply PCB (all switched PS).

Power supply initial version: big PCB with adjustment potentiometer. Not compatible with other versions.

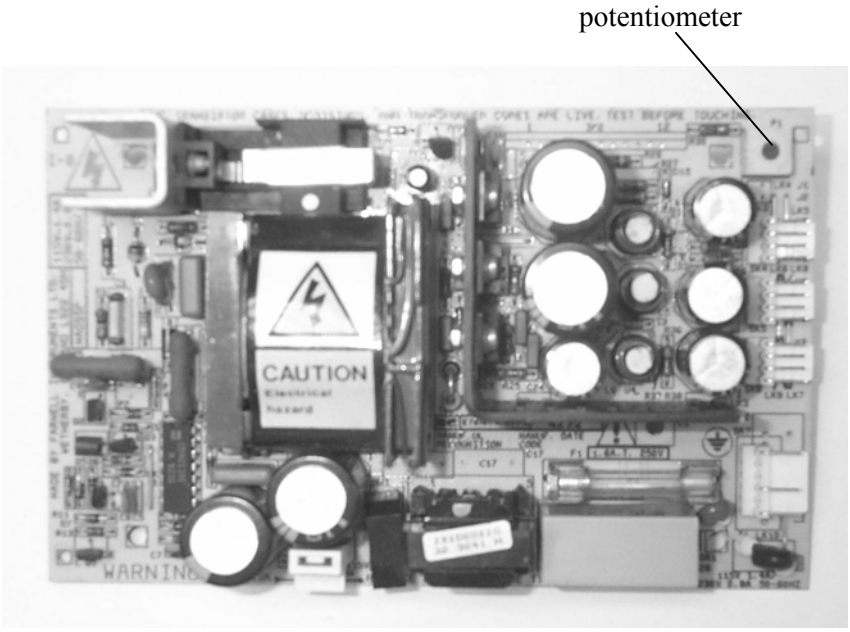


Photo 1

Power supply FUBA 702: small PCB without potentiometer

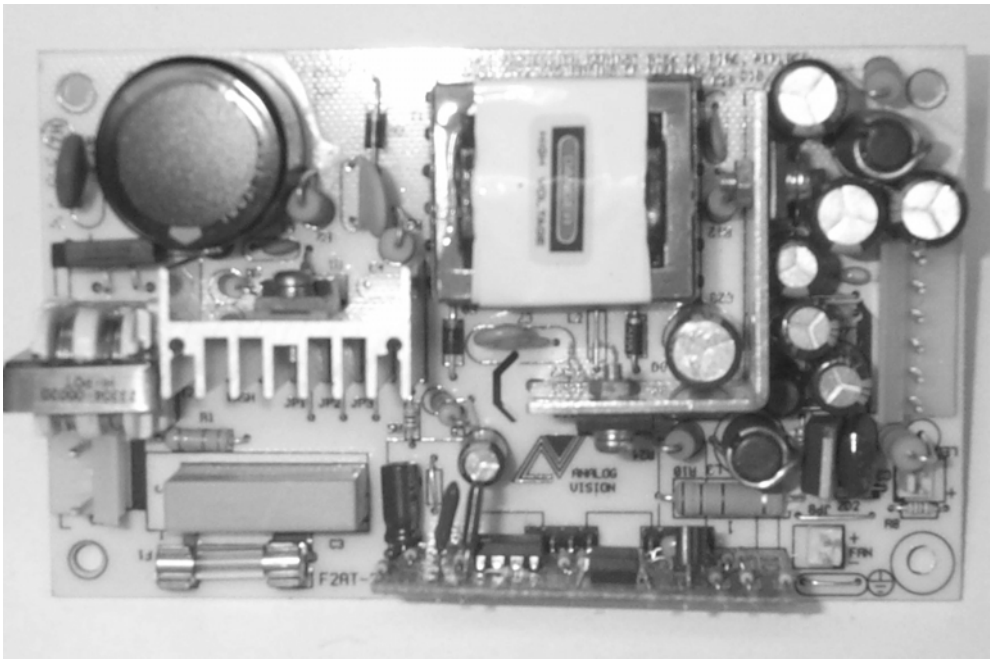


Photo 2

Measuring points:
Orange-black: +5V DC
Brown-black: +15.05 VDC

Power supply FUBA 702A: same as FUBA 702, but with adjustment potentiometer.

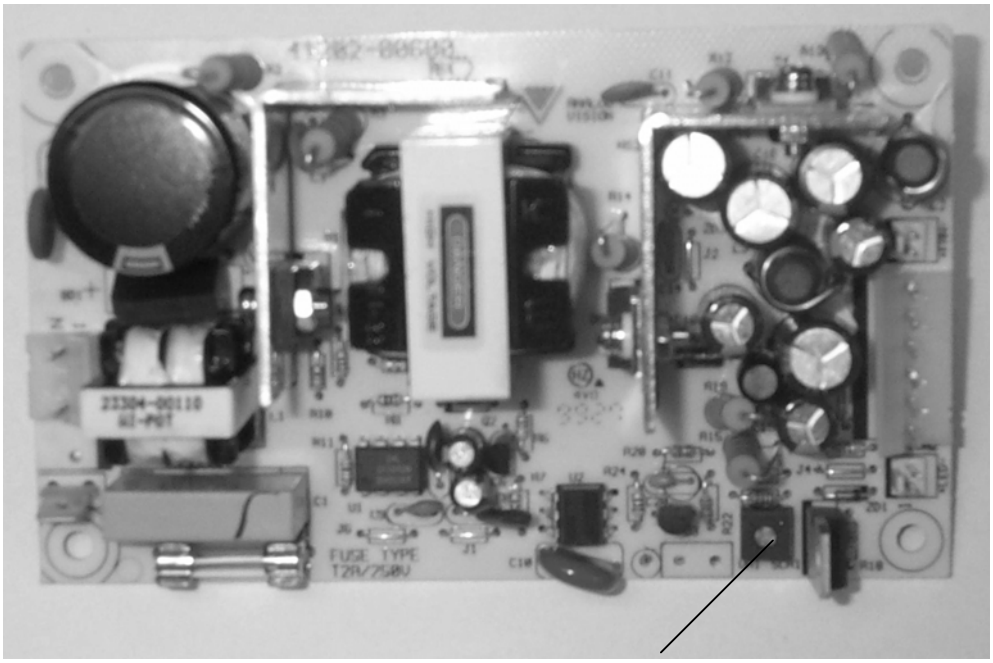


Photo 3 Potentiometer

230V: starting from units with SN B6058

- The FUBA 702 power supply is fully compatible with the FUBA 702A board.

- All the units starting with SN 6xxx are manufactured by Uniphy ELMED. Units with SN <6xxx are manufactured by TUR.

7. Generator checkup and adjustment procedures in standby mode: STEP 1.

The first step of checking/repairing the Thermatur 200 has to be performed in standby mode.

7.1 Generator power supplies

Photo 1. All measured in standby mode.

Between 1and 2: 44 VRMS- 48VRMS (AC)
Between 3 and 4: 25 VRMS- 28VRMS (AC). If this voltage = 0V, check fuse F003 on mains transformer.
Between 5(+) and 6 (-): 30 VDC

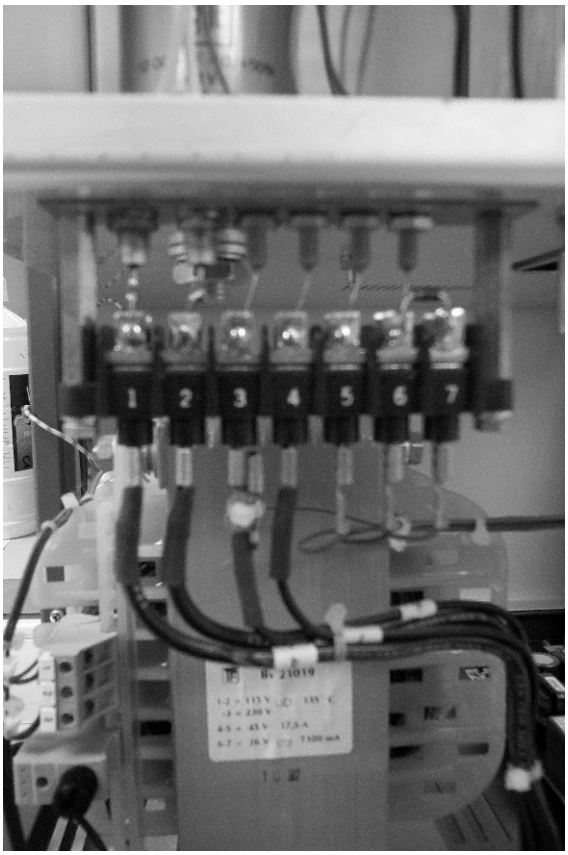


Photo 4

Measurements on RF generator (A 200).

☝ Ground level = X1 or aluminium chassis. All voltages are measured against ground.

X 9: - 15 VDC = blue wire
X 6: +15 VDC = brown wire

7.2 Adjustment of +15 VDC

The most important is +15 V. Always adjust it to 15.05 VDC (in standby mode!) on the power supply PCB (chapter 7.2).
For version 2 of power supply PCB (without adjustment potentiometer): check the voltage. If there is a strong deviation, replace the board.

☛ In case of a generator replacement, always check/adjust the +15 VDC supply to 15.05 V (chapter generator replacement) and correct the zero point calibration.

7.3 Zero point calibration.

The measuring of RF power is performed by the multiplexing IC NO2 (IC KP 525 PS) Point 1 photo x.
In order to have a correct measurement and a proper functioning of the generator, the zero point settings (offset corrections) have to be calibrated.

Procedure:

- Draw off X11 and X12
- Switch on the unit (standby mode)
- Adjust 15.00V to 15.05 V between X6(+) and ground X10.
- Connect X14 and X15 to ground (X13)
  Adjust 0.00V at X16 by R5
- Connect X15 to +5V (photo 5) and X14 to ground
  Adjust 0.00V at X16 by R4
- Connect X14 to +5V and X15 to ground
  Adjust 0.00V at X16 by R3.

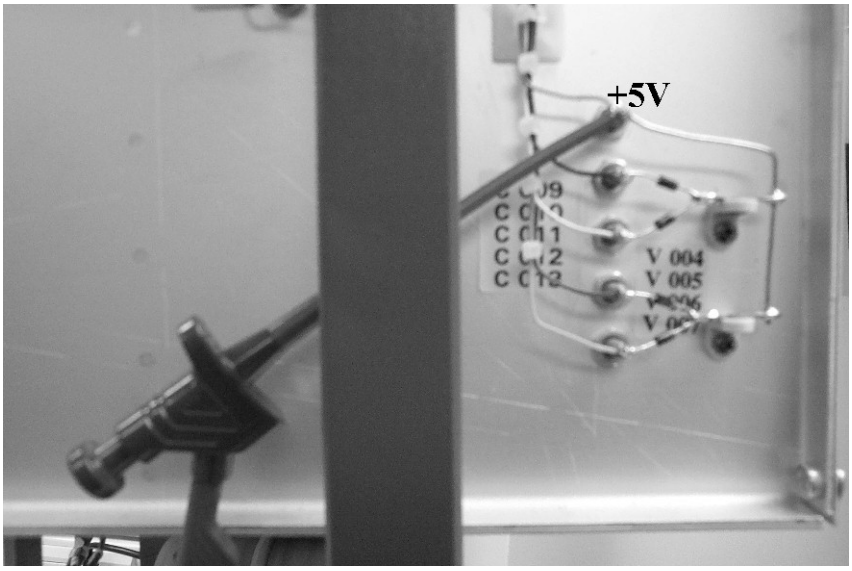


Photo 5: 5V (right rear side of unit)

7.4 Oscillator check

The 27.12 MHz oscillator can be checked at the collector of transistor V9 (cooling surface of V9). Measure this signal with an analog oscilloscope, AC.
The voltage must be tuned between 12 Vpp and 14 Vpp by L10 (photo 1,

Adjustments and repair:

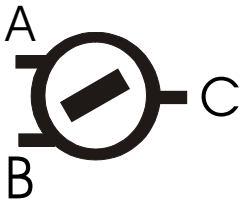
No oscillator frequency at all: replace Q1
Oscillator frequency out of limits: adjust coil L11 with small screwdriver.

7.5 Check and repair of potentiometer R52.

Due to RF power, some potentiometers might get a burn-in problem. This problem is typical for R52 and the result is always the same: no output power.
How to check whether this potentiometer is broken:

There are 2 different types of potentiometer: 47 Ohm and 100 Ohm

Switch off the unit and measure both sides of the potentiometer (no need to take it out !)



Measure the following resistances:
A-C + C-B = 100 Ohm or 47 Ohm (more or less)

If not: replace potentiometer.

➧ Important: always put the new resistor in the same position. If you switch from 47 Ohm to 100 Ohm, always calculate the new position of the potentiometer in a way that the resistance of A-C is the same as before.

7.6 Collector voltage regulator.

Switch on the unit in standby mode.

Switch on the unit and wait 30 seconds (this is important).

Measure voltage on X 205 (red wire) and earth X206 (black wire or aluminium generator housing).
Voltage on X 205: fluctuating between 10 VDC and 14 VDC

Mark the position of potentiometer R55
Turn R55 counter clockwise and check DC voltage: maximum voltage must be between 24 VDC and 26 VDC. If not, replace IC B4707 and check again.
After replacement, check proper functioning and calibrate when necessary (8.2.2)

8. Generator check-up and adjustment procedures during operation: STEP 2.

Always perform complete check-up procedure STEP 1 (chapter 9) before performing step 2.
All measurements are performed directly on the generator by means of a 50 Ohm dummy load.

➧ Always make sure that the dummy load doesn't heat up because it will influence the measured voltage on the dummy load !

8.1 Checking the collector voltage regulator during operation

The collector voltage of the amplifier BLW96, depends on the output power. The following procedure explains how to check and correct this value.

Connect the 50 Ohm dummy load directly to the generator.
Switch on the unit and select the triplode, continuous mode, 5 min. and raise intensity:

Output power (Watts)	Voltage at X205 (Volt)
0	about 13 V
50	about 29 V
100	about 36 V
150	about 41 V
200	about 44 V

In case of a strong deviation, this voltage can be corrected with R 55.

8.2 Minimum power adjustment.

The minimum output power of thermatur 200 is 9 Watts. The procedure below explains how to measure and calibrate this value.

Connect the 50 Ohm dummy load directly to the generator.
Connect a multimeter to the output connectors of the dummy load (DC voltage).

Switch on the unit and select the triplode, continuous mode, 5 min. and set to minimum power (9 Watts):
The voltage on the multimeter must be between 3.0VDC and 3.2VDC. Correct this voltage with potentiometer R65 that is mounted on the display PCB!
The tuning bargraph has to be lit completely!

➧ No need to take out the display PCB: there is a hole in the PCB that allows to correct R65.

8.3 Maximum power adjustment.

The maximum output power of thermatur 200 is 200 Watts. The procedure below explains how to measure and calibrate this value.

Connect the 50 Ohm dummy load directly to the generator.
Connect a multimeter to the output connectors of the dummy load (DC voltage) (Photo 6)

Switch on the unit and select the triplode, continuous mode, 5 min. and raise intensity.

Output power (Watts)	Voltage measured on output dummy load (Volt DC)
50	about 7 V
100	about 10 V
150	about 12 V
200	about 14 V

Step 1: Correct the output power with R2 on the generator PCB.

Step 2: measure the voltage on X7 and X8. The value measured on X8 must be equal to X7/2. Correct this value with R21 in combination with R2 (alternating)
Repeat the measurement of step 1 since this correction will have influence on the measurements of step 1.

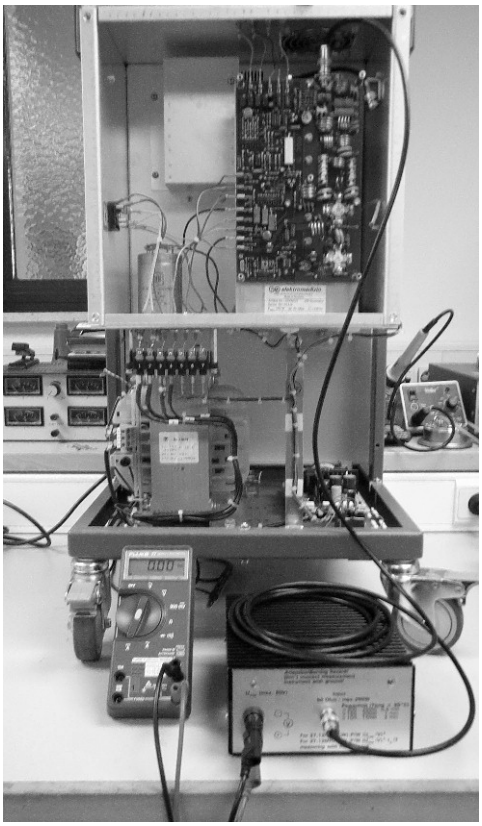


Photo 6
In case of no output power at all: check 9.1 (collector voltage regulator).

8.4 Self-oscillation problems.

Self-oscillation of the generator might cause a bad tuning between the unit and the patient, or might cause an error code FE2, FE3 or FE4.
The reason of this oscillating problem might be the unit or the accessory.

How to check if the unit is oscillating.

Connect a reference accessory to the unit and perform a test. If the reference accessory is working fine (at least 8 digits on tuning bargraph), then the original accessory needs to be recalibrated. Send to our service department for calibration.

If the problem appears to be the same with the reference electrode, the generator might be oscillating.

Perform the steps below:

- Connect the thermoplode directly to the generator by means of the Lambda/2 cable.
- Put the plode on a patient, on a spot where full tuning can be expected.
- Raise intensity to maximum allowed for that particular accessory.
- Count the number of digits on the tuning bargraph.
- Take the plode away from the patient and put it back on the same spot.
- If the tuning bargraph indicates less digits than before (in point 4) than the generator is oscillating: replace generator (Ch. 11)
- If the tuning barhgraph was indicating less than 6 digits in the first place (point 4) replace the generator as well (Ch. 11)
- If the result of this test seems to be OK, check the harmonic filter PCB (Ch. 9.2) and the output circuit (Ch. 9.3)

8.5 Current consumption.

Measure the following DC currents with a DC multimeter (10A DC scale)

➧ this value can only be measured with a moving coil current measuring instrument, or with a digital multimeter in case a 50 Ohm dummy load is connected.

- X6 (brown wire) : typical <=1.2 A with 200W output power
- X5 (red wire): typical < 6,6 A with 200 W output power

➧ In case of strong deviations: replace the generator (Ch. 11).

General checkup procedures
If, after a successfully check and adjustment of step 1 and 2, the unit is still showing problems with tuning or output power, there are 3 more possible causes.
- Problems with accessories
- Problems with harmonic filter (A500)
- Problems with output circuit board (A300)

8.6 Problems with accessories

The best way to check an accessory is simply to check the unit with a reference accessory (a new one).
When the problem appears to be the same with the new accessory, perform the test below:

For coil field electrodes:
Connect a coil field electrode (8 cm, 14 cm or triplode) directly to the generator by means of a lambda/2 cable.
Raise intensity to maximum allowed power (8cm: 30 W, 14 cm: 90 W, articulated plode: 200 W) while putting the plode on a patient (the surface must me at least as big as the surface of the plode)
Now check the tuning bargraph: at least 8 led's must be on. If not: the problem might be the generator: perform all the tests as explained in chapter 8 and 9. Replace the generator if necessary.
When at least 8 LED's are on, connect the plode to the normal output connector (rear side of the unit) and compare. When less than 8 LED's are on, perform the check as explained in 10.2 and 10.3.

For capacitor electrodes:
Connect the lamp dummy load to the unit (photo7) and open the back cover completely.
Switch on the unit and raise power up to 200 Watts.
Now check if the lights are fully on and stable.
If not; perform the check as explained in 10.2 and 10.3.

Photo 7

8.7 Harmonic filter PCB.

Typical for this PCB are bad soldering connections. They may even not be visible without a microscope, but they may influence the tuning in a negative way.
Resolder the soldering points of the big coils.
Another problem might be the capacitors. Check for short circuit, and replace capacitors when necessary.
Touch each capacitor with a small screwdriver. If on them brakes off: replace.

8.8 Output circuit (A300)

The output circuit board contains a big variable capacitor, driven by a stepping motor.
The capacitor has a main part (7 plates) and a fine tuning part (1 plate). When the motor is only turning slightly, only the fine tuning capacitor plate will turn. When the motor starts rotating, all the capacitor plates will turn.

Open the back cover of the unit plus the aluminium cover of the capacitor electrode and connect the lamp dummy load to the unit (photo7).
Now check the capacitor: only the fine tuning capacitor plate may turn up and down a little bit. The big plates may not turn. If not, turn the screw (photo8) in the middle of the capacitor half a turn clockwise and check again.
If necessary, readjust until the system works fine.
: If the capacitor doesn't turn at all, the motor pulley might be unfixed. Refix the pulley and check again.

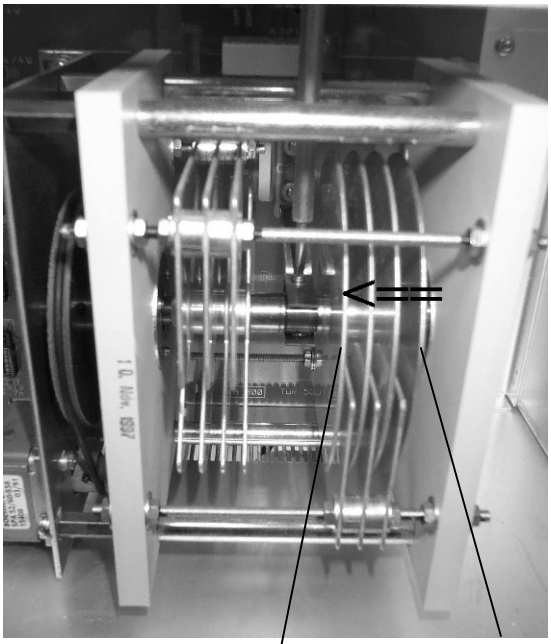


Photo 8 fine tuning capacitor plate (1 plate)
Main capacitor plates (7 plates)

9. Generator replacement procedure.

If al the repair and calibration procedures may not solve the problem, the generator might be broken. In case of a generator replacement follow the steps below:

- Mark the cable connections of the generator before disconnecting the wires.
- Desolder the wire on the thermistor (right side of the generator)
- Remove the screws that fix the generator (2 on the bottom and 1 on the right side)
- Take out the generator.
- Repeat step 2-4 in reverse order.
- Adjust +15V to 15.05 V (procedure in chapter 8.2)
- Perform the 0 point calibration (procedure in chapter 8.3)
- Perform test with lamp dummy and accessories (procedure in chapter 10.1)

☛ When sending back the defective generator, always send it together with the heatsink and cover plate and pack it very carefully !!!

10. Error codes.

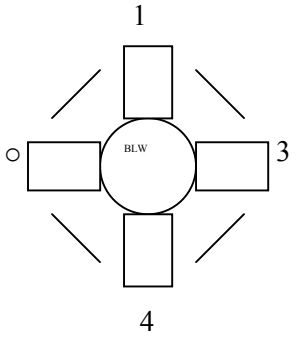
11.

Error code	Description	Possible cause
FE 2	- Pspec=0; Pact>0 - Control input Uin or measuring input is open	The microcontroller measures power, while the intensity settings are 0. This might be a problem with the zero adjustment (CH 7.3). Most of the time a generator oscillation fault (Ch. 8.4)
FE3	- Pact>Pspec +5Watt - Generator is oscillating	Perform zero adjustment (Ch. 7.3) and power measurement of generator (Ch 8.2/8.3). Most of the time a generator oscillation fault (Ch. 8.4)
FE4	- Pulse function is disturbed. The pulse pause power is too high.	Perform zero adjustment (Ch. 7.3) and power measurement of generator (Ch 8.2/8.3). Most of the time a generator oscillation fault (Ch. 8.4)
FE6	- Pact(measured)<Pspec - No signal at Up - Excessive load fluctuations	The measured power is smaller than the set power. Perform 9 Watt adjustment (Ch 8.2) Generator might be oscillating(Ch. 8.4)
FE7	- Excessive operating voltage of the power stage.	Collector voltage of BLW96 >50V. Check voltage control circuit (manual page)
FE8	- Operating voltage of the power stage is too low	Collector voltage of BLW96<6V Check voltage control circuit (manual page) and fuse F003.
FE9	- Interruption of the thermistor circuit R0003	Check leads of the thermistor R003. Resistance should be +/- 1K6 at room temperature.
FEa	- Signal Us+Ud is missing - +15V is missing	Probably generator gives no output power. Oscillator does not work work, R 52 maybe defect (Ch. 7.5) Check and replace generator if necessary.
FEb	- Generator is overheated	Check fan and perform general check-up of unit.
FEc	- Emergency switch was activated or the circuit of emergency switch is interrupted	- Replace emergency switch when necessary.
FE	- Not all parameters are set.	User error. Select time, accessory and mode.

12.

13. Checkup procedure of BLW96.

In case of no emission of the generator. The BLW 96 might be broken.
In order to make sure, please perform the test below.



- Disconnect pin 1 and 4.
- Measure diode on both directions between all the junctions (1-2, 2-3, 3-4, 1-4, 2-4, 1-3). One direction must emit and the other must block. If not: BLW is broken.

☛ Important remark: the BLW96 cannot be replaced, due to the fact that the generator needs to be recalibrated.
Replace generator.

A200 Generator PCB Layout